

## FY04 R&TD Mid Year Status Report

July 16, 2004

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### **Task Name or Descriptive Title of Work:**

Preparing Goddard for Large Scale Team Science in the 21<sup>st</sup> Century: Enabling an All Optical Goddard Network Cyberinfrastructure

### **Objective:**

Establish a "Lambda Network" (L-Net), in this case using optical wavelength technology and 10 gigabit per second (Gbps) Ethernet per wavelength, from GSFC's Earth science Greenbelt facility in MD to the Scripps Institute of Oceanography (SIO) through the University of California, San Diego (UCSD) facility over the National Lambda Rail (NLR), a new national dark optical fiber infrastructure.

### **Description:**

Introducing elements of the NSF cyberinfrastructure and associated middleware to the research community at Goddard. Demonstrating how the lambda net and accompanying middleware can help to build "virtual communities" for science research. Developing and nurturing collaborations with the UCSD university consortium, particularly with SIO, one of the key consortium members, which will be the focus of the prototype. Extending the capabilities of the Earth System Modeling Framework (ESMF) such that interoperability between models, model components, geospatial services, and other functions can exist across distributed computing platforms. Understanding and resolving technical issues associated with the lambda network and demonstrate its capabilities to the Goddard community.

### **Technical Approach:**

- Transcontinental, Regional, and GSFC Local Networking
  - Become a member of the NLR, in collaboration with the NREN Project, through a Mid-Atlantic Terascale Partnership (MATP) membership arrangement
  - Connect GSFC with the NLR at McLean, VA, via fibers or lambdas from Level3 Communications and/or the UMCP-led Dynamic Resource Allocation via GMPLS Optical Networks (DRAGON) project
  - Use NLR's initial lambdas for science/application experiments between GSFC and UCSD/SIO
  - Enable a connection from GSFC's *Thunderhead* cluster in building 28 across the NLR to other clusters such as those at SIO or others on UCSD's OptIPuter network first at 1-GE, then 10-GE
- Application Development
  - Integrate ESMF software with GRID middleware by constructing prototype interfaces between the components Identify requirements for new methods and/or messages that would be desirable for supporting GSFC models and data assimilation

Our overall plans are well worked out as summarily illustrated in the attached "L-Net\_status\_071304.ppt" ppt file

**Schedule:**

[Given 2Mar04 “effective start” (I.e., date of permission to use awarded funds)]

- By 31May04 demonstrate initial use of 10-GE and multi-wavelength network technologies within GSFC in test of L-Net designs
- By 30Aug04 with DRAGON project demonstrate use of optical network technology switching among three 2.4 Gbps wavelengths among GSFC, UMCP, and USC/ISI-E in Arlington, VA
- By 30Nov04 connect GSFC at 10 Gbps with NLR at McLean, VA
- By 28Feb05 demonstrate science/applications between GSFC and UCSD/SIO across the NLR

**Progress to Date:**

- Identified and began readiness preparation for the initial top five science applications to use the planned 10 Gbps L-Net between GSFC and UCSD/SIO
- Planned commitments for all new hardware/software acquisitions for the L-Net by 31Jul04. Greater than 95% of our PR's for the 10-GE and 10x1-GE/1x10-GE switch components we plan to deploy at GSFC and at the NLR/Level3 POP in McLean have been submitted to SEWP
- Planned all hardware/software installations and initial use of the L-Net to start in Sep/Oct04 if the procurements proceed well. Almost all aspects of our design have been checked out with loaner equipment (but at various times).
- Arranged for GSFC membership in the Virginia Polytechnic Institute and State University-led MATP through which GSFC obtained rights as defined for Class A members to use the assets and services of the NLR, giving us full rights to use the NLR's 10-GE Shared IP lambda and the 1-GE VLAN lambda, and our prospects for being able to experimentally use the 10-Gbps HOPI lambda are also in good shape

**Issues or Challenges:** *(new or preexisting)*

Presently identified applications run slower than the L-Net.

**Plans and Milestones for Remainder of Year:**

Leasing new Level3 provided dark fiber-pairs extending the DRAGON to, with co-location space in, the Level3 POP at McLean for connecting there with the NLR. We're tooling up to have two 10-GE lambdas across DRAGON between GSFC in Greenbelt and the NLR/Level3 POP in McLean. Within GSFC the L-Net will host and interconnect 10 GE interfaces for 12 separate systems.

**Plans for FY05+:**

Expanding to connect more clusters. Preparing more science applications to use the planned 10 Gbps L-Net.